

ABSTRACT

Disclosed are methods for producing a solid filament from a liquid in a vacuum chamber, comprising the following steps: a gas is liquefied in a heat exchanger apparatus to produce the liquid; and the liquid is delivered into the vacuum chamber via a supply duct and through a nozzle. Liquefying of the gas in the heat exchanger apparatus encompasses adjusting a p-T operating point of the liquid at which the liquid is transformed into the solid aggregate state and forms a collimated and stable jet after being discharged from the nozzle into the vacuum chamber. Also disclosed are nozzle arrangements for producing solid filaments in a vacuum.